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THE ROLE OF TECHNICAL SCHOOLS IN IMPROVING THE SKILLS AND EARNING CAPACITY OF RURAL MANPOWER, A CASE STUDY. FINAL REPORT.

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AN EFFORT WAS MADE TO ESTABLISH A BASIS FOR EVALUATING THE PRIVATE AND SOCIAL COSTS AND RETURNS ACCRUING FROM INVESTMENT IN RURAL TECHNICAL SCHOOLS. A SERIES OF STATISTICAL FORMULAS WAS DEVELOPED AND TESTED ON QUESTIONNAIRE DATA SUPPLIED BY 359 GRADUATES AND TRAINEES OF THE WINONA AREA TECHNICAL SCHOOL IN MINNESOTA. THE NINE PROGRAM AREAS OF MANPOWER DEVELOPMENT AND TRAINING ACT (MDTA) INSTRUCTION WERE AUTO MECHANICS, AUTO BODY REPAIR, INDUSTRIAL ELECTRONICS, HIGHWAY TECHNICIAN, MACHINE TOOL AND DIE MAKING, WELDING, GENERAL OFFICE CLERK, PRACTICAL NURSING, AND STENOGRAPHY. SYSTEMATIC DOWNWARD BIAS WAS INTRODUCED INTO EACH VARIABLE IN ORDER TO KEEP FORMULAS CONSERVATIVE. PRIVATE COST INCLUDED STUDENT DIRECT AND INDIRECT COSTS. ANNUAL PRIVATE RETURN WAS CALCULATED UPON THE BASIS OF PRE- AND POST-TRAINING ANNUAL INCOMES. SOCIAL COSTS WERE BASED UPON EDUCATIONAL EXPENDITURES, CAPITAL SPENT, AND MDTA SUBSIDIES TO STUDENTS. SOCIAL RETURNS WERE BASED UPON GROSS EARNING DIFFERENTIALS. FINDINGS LED TO THE CONCLUSION THAT THERE WERE WIDE VARIATIONS IN PRIVATE GAINS. THE ZERO-OR-LESS GAINS WERE OFFSET BY THE INTANGIBLE SATISFACTION EXPRESSED BY TRAINEES. MEDIAN PRIVATE GAIN RATES WERE HIGHER OR EQUAL TO AVERAGE RATES EXPECTED OF OTHER INVESTMENTS. MEDIAN SOCIAL GAIN RATES WERE LOWER THAN OTHER SOCIAL INVESTMENTS. ABOUT 80 PERCENT OF THE GRADUATES WERE REMAINING IN THEIR COMMUNITIES. (JM)

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Final Report to the Office of Manpower Policy, Evaluation and Research

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P R E F A C E

This is the report of a pilot study carried out by Dr. Svetozar Pejovich and William Sullivan of St. Mary's College, Winona, Minnesota. It was sponsored by the Office of Manpower Policy, Evaluation and Research, U. S. Department of Labor. Support was provided through a research grant award, as authorized under Title I of the Manpower Development and Training Act of 1962, as amended.

Dr. Pejovich and Mr. Sullivan sought to establish a basis for evaluating the private and social costs and returns accruing from investment in rural technical schools. They developed a series of statistical formulas and tested it on questionnaire data supplied by 359 graduates and trainees of the Winona Area Technical School in Minnesota. Details of their methods, findings, and conclusions are presented in this report.

In undertaking such projects under Government sponsorship, researchers are encouraged to express freely their professional judgment. Therefore, points of view or opinions stated in this document do not necessarily represent the official position or policy of the Department of Labor. St. Mary's College assumes full responsibility for the design and implementation of this study and for the conclusions reached by its authors.

I. INTRODUCTION

Federal subsidy of a number of instructional programs offered by technical schools is one important manifestation of heightening Governmental awareness of the private and social gains to be realized from investment in human capital. Conceived as a means of upgrading national manpower resources and alleviating unemployment, area technical schools are expected to benefit both public and private interests in the economy as a whole as well as economic regions. Federal support for a number of instructional programs offered by technical schools is provided under the Manpower Development and Training Act of 1962 (MDTA).

The purpose of this study is to provide some basis for appraising instructional programs offered by technical schools in rural areas. Its two essential objectives are: (1) to calculate the private and social gains from investment in technical schools, and (2) to spotlight the advantages to inadequately skilled labor in rural areas afforded by investment in retraining and skill development.

In Minnesota, 292 MDTA instructional and on-the-job training projects involving 8,689 trainees in 128 different occupations had been approved from September 1962 through August 1965. This study focuses on the Winona Area Technical School (WATS) in Winona, Minnesota. Its students come from 14 counties in Minnesota, 5 in Wisconsin, and 1 in Iowa. Currently, the school offers instructional programs in the following nine areas: auto mechanics, auto body repair, industrial electronics, highway technician, machine tool and die making, welding, general office clerk, practical nursing, and stenography. Plans are in progress to offer several additional programs, including food service, graphic arts, accounting, and technical drafting.

The area served by WATS is predominantly rural. Of all counties represented in the school's enrollment, in only one (Olmsted, in Minnesota, which is the site of the Mayo Clinic and an IBM plant) has immigration shown a net increase. Dependence on agriculture is reflected in the income data; the median family income in the area is about 85 percent of the family median income for the country as a whole. At the same time, the average rate of reported unemployment is only slightly above the nationwide rate. Thus, the average productivity of labor in the area served by the WATS is relatively low.

II. THE MODEL

The Winona Area Technical School is a substitute for on-the-job training with one important difference: a part of the general outlay on training is borne by the community. It follows that a distinction must be made between the private and social rates of return on investment

in education provided by the school.

The conceptual and statistical difficulties involved in estimating rates of return on investment in human capital are well-known. At best, calculated rates of return offer a reasonably good estimate of true private and social gains. In order to add a dimension of certainty to the results, a systematic downward bias was introduced into a number of estimated variables. Thus, it can be claimed that the calculated rates of return in this study are either equal to or below the true rates of return on investment in education offered by the WATS.

Table 1. Social and Economic Background of the Area Served by WATS, 1960

Counties	Net Migration as a Percent of the Labor Force	Median Family Income a/	Unemployment as a Percent of the Labor Force	Adult High School Graduates as a Percent of the Labor Force b/
Minnesota:				
Winona	-.97	4,984	6.1	38.8
Fillmore	-1.38	3,892	7.3	36.7
Le Sueur	-.98	4,251	5.9	35.4
St. Louis	-.21	5,455	7.5	44.1
Morrison	-1.54	3,693	4.9	26.9
Olmsted	+1.12	6,043	4.0	52.2
Goodhue	-.89	4,830	4.8	38.5
Freeborn	-.74	4,922	4.9	39.1
Carlton	-.39	5,641	5.8	37.7
Lac Qui Parle	-2.22	3,088	5.8	33.8
Houston	-.28	4,326	4.3	35.7
Wabasha	-1.28	4,591	2.1	35.6
Faribault	-1.56	4,082	5.6	39.6
Kanabec	-1.23	3,739	6.1	31.6
Wisconsin:				
La Crosse	-.88	5,671	6.1	45.6
Pierce	-.85	4,804	5.1	37.7
Washburn	-2.12	3,859	6.5	36.0
Buffalo	-1.65	4,056	3.3	34.7
Trempeleau	-1.20	4,058	5.7	30.8
Iowa c/	-----	-----	---	----

a/ U. S. median family income was $5,620 in 1960.

b/ Adult high school graduates comprised 41.1 percent of the U. S. labor force in 1960.

c/ Information was not available on the one Iowa county served by the WATS.

Source: James Henderson and Anne O. Krueger, National Growth and Economic Change in the Upper Midwest (Minneapolis: University of Minnesota Press, 1965), pp. 207 - 227.

Private Rate of Return

The Private Costs of Investment in the WATS. The sum total of costs borne by the student are direct costs (D), such as fees, supplies, and transportation, estimated at $50 per student; and indirect costs, which are calculated for each student by subtracting his actual earnings (E) while attending the school from what his earnings might have been (P) if he had not invested in WATS training. The latter is calculated by multiplying the student's weekly full-time earnings just before entering the school by the length (in weeks) of the instructional program which he attended. If no previous employment was reported, then what the student might have earned is estimated as follows: the ratio of median income (.85) is multiplied by U. S. average income at the respondent's age and educational level, and the result is adjusted for the length of the instructional program which he attended. This estimate is valid because labor mobility in the area served by WATS, especially for those with 12 years or less of schooling, is relatively low; net migration from the area is not overly serious; and the percentage of adult high school graduates is near the national average (table 1). Also, of the 323 persons who graduated from the WATS since 1960, about 80 percent have remained in the area.

After actual and potential earnings are adjusted for the average fraction of income paid in taxes by each income class, the private costs of investment become:

$$C = D + [P(1-t_1) - E(1-t_2)]. \qquad (1)$$

The Annual Return on Investment in the WATS. The annual return on investment in WATS is defined as the absolute differential between the WATS graduate's annual full-time income after taxes $[A(1-t)]$ and his estimated income for the same year if he had not made any additional investment in education (including on-the-job training) beyond the level he had attained before entering the WATS $[B(1-t)]$. The sum total of returns from investment in the WATS is:

$$R = \sum_{j=1}^{n} [Aj(1-t) - Bj(1-t)], \; j = 1,2,\ldots n, \qquad (2)$$

where (j) is the interviewing year and (n) is the number of years between the respondent's graduation from the WATS and his retirement. (It is assumed that men retire at age 65 and women, at age 62.)

The absolute earning differential is likely to grow annually at some average rate (1 + g) 1/. Based on the following considerations, the value

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1/ It is assumed that all trainees would have been employed if they had not entered training. This would increase the opportunity costs and lead to still another instance of downward bias in estimating net benefits.

of (g) was assumed to be zero: (1) Rising levels of average educational attainment and the increasing influence exerted by organized labor will tend to reduce, if not eliminate or even reverse, changes in absolute earning differentials; (2) Gary Becker estimated the private rate of return from college education at 12.7 and 11.7 percent with (g) equal to one and zero respectively, indicating that the difference in (g) of a point or so may not be overly significant; 2/ and (3) an estimate of g = 0 is likely to be either equal to or below its true value, and is therefore a downward bias.

Although the absolute earning differentials may remain approximately constant, both the actual and estimated foregone earnings are likely to increase from one year to another. Similarly, since marginal tax rates are higher than the average rates, the average fraction of income paid in taxes must change from one period to another. Not knowing how rapidly individual respondents will move from one income class to another, our estimate, once again, is biased downward. In equation (2), (Aj) is multiplied by the average effective rate for the country as a whole (13.1 percent), adjusted for the Revenue Act of 1964. It is calculated that the Act has reduced effective rates by about one-fifth, that is, from 13.1 to 10.5 percent. The average tax rate on Bj in equation (2) is taken to be 9 percent.

Equation (2) can now be written as:

$$R = \sum_{j=1}^{n} (.895\ Aj - .91\ Bj)\ j=1,2,..,n. \qquad (3)$$

It is assumed that the average number of hours worked per week is 40. Since the future performance of the economy cannot be predicted, no adjustment is made for the incidence of unemployment.

The Private Rate of Return on Investment in the WATS. First, a private rate of return on investment in education offered by the WATS is calculated separately for each person. The formula used is:

$$D + \left[P\ (1-t_1) - E\ (1-t_2)\right] = (.895\ Aj - .91\ Bj) \times H, \qquad (4)\ 3/$$

where (j) is the interviewing year and (H) is the present value of an annuity of one dollar per year for a period of (n) years at rate of return (r). This would make the present value of a series of annual returns equal to the sum total of private costs. Secondly, all r's are grouped by instructional programs, and the average private rate of return (r_o) is calculated for each of the nine WATS programs.

2/ Gary Becker, Human Capital (New York: Columbia University, 1964), p. 78.

3/ Refer to footnote 5 on page 10 to see how this equation is used to calculate rate of return.

Social Rate of Return

The Social Costs of Investment in the WATS. In measuring social rates of return (and social costs), social benefits which do not accrue to the individual but are attributable to his investment in education must be counted as part of the return on investment. This is why social returns are measured by the before-tax earnings differential, and indirect social costs by the before-tax earnings foregone.

Total costs are the sum total of direct social costs and indirect social costs. Direct costs ($\overline{D}$) are educational expenditures, capital spent on education, and direct MDTA subsidies to students. Indirect social costs are the same as indirect private costs, except that earnings are not adjusted for tax payments. The sum total of a student's social costs is:

$$\overline{C} = \overline{D} + (P-E) . \qquad (5)$$

Social Returns on Investment in the WATS. The annual social gain from investment in education provided by the WATS is the absolute difference between the respondent's gross earnings in the interviewing year and what he might have earned in the same year if he had not made any additional investment in his education beyond the level he had attained before entering the WATS. The sum total of returns on investment in education provided by the WATS is:

$$\overline{R} = \sum_{j=1}^{n} (Aj - Bj) . \qquad (6)$$

The Social Rate of Return on Investment in the WATS. First, a social rate of return on investment in the WATS is calculated for each respondent as follows:

$$\overline{D} + (P - E) = (Aj - Bj) \times H, \qquad (7)$$

where (H) is the present value of an annuity of one dollar per year for a period of (n) years at rate of return ($\overline{r}$), which makes the present value of a series of annual returns equal to the sum total of social costs. Secondly, all $\overline{r}$'s are grouped by instructional programs and the average rate of return ($\overline{r}_o$) is calculated for each program.

An additional adjustment is made with respect to the social rates of return in the practical nursing, stenography, and general office clerk programs. Only females are enrolled in these programs, and after they marry, they tend to drop out of the labor force either temporarily or permanently. We shall assume that, on the average, a female remains in the labor force for half the number of years between her graduation from WATS and age 62. This adjustment need not be made for private rates of return because girls usually

exchange income for family voluntarily, so it can be presumed that no financial loss is involved. Also, equation (8) is adjusted for females' lower earnings and is taken to be:

$$R = \sum_{j=1}^{\left[\frac{n}{2}\right]} (.925\,Aj - .930\,Bj),\ j = 1,2,..,\left[\frac{n}{2}\right] \qquad (8)$$

III. SOURCES AND USES OF DATA

To calculate the private and social rates of return on investment in education offered by the WATS, a number of data were utilized.

Private Rates. Questionnaires were mailed to everyone who had successfully completed WATS programs from 1960 through 1965 and to all students then enrolled in training (fall 1965). The population consisted of 323 "graduates" and 169 trainees. Replies were received from 190 graduates (60 percent) and all of the trainees. Returned questionnaires were classified by WATS courses and within those classifications were reviewed and analyzed separately. Essential information gleaned from each questionnaire consisted of the respondent's age, previous level of educational attainment, former or pre-WATS earnings, earnings during training, and present earnings--all pertinent to private costs and returns on his investment in the WATS program.

Supplementary secondary sources were used as bases for calculating necessary adjustments in costs, private earnings, and returns as reported by questionnaire respondents. Questionnaire data were manipulated in three ways suggested by these supplementary sources to adapt them to the formulations of the model presented in part II of this study.

In the first place, the respondent's actual earnings (E) and what his earnings might have been if he had not entered the school had to be adjusted to account for variances in applicable Federal income tax rates. Richard Goode ascertained the effective tax rates schedule as shown in table 2.

Secondly, when respondents reported no pre-WATS earnings, the U. S. Statistical Abstract, 1964, was used as a basis for calculating the respondent's estimated income by educational class and age bracket. This was accomplished by relating overall average earnings in the WATS area for each classification (from Henderson and Krueger, table 1) to national averages in income for the same age and educational classes (table 3).

Table 2. Effective Rates of Individual Income Tax Adjusted for the Revenue Act of 1964

Total Income Class ($1,000)	Actual Tax Rate
Less than 1	2.7
1 - 2	6.4
2 - 3	7.0
3 - 4	7.5
4 - 5	7.6
5 - 6	7.8
6 - 7	8.2
7 - 8	9.0
8 - 9	9.6
9 - 10	10.2
10 - 15	11.4

Source: Richard Goode, The Individual Income Tax, Washington, D.C., the Brookings Institution, 1964, pp. 271 and 326.

Table 3. Median Income by Sex, Age, and Years of School Completed, 1964

Age and Sex	YEARS OF SCHOOL COMPLETED				
	Less than 8	8	8-11	12	more than 12
Male					
25 - 34 years	$ 2,939	$ 4,337	$ 4,903	$5,612	$ 6,075
35 - 44 years	3,500	5,048	5,730	6,534	7,604
45 - 54 years	3,534	5,123	5,642	6,465	7,429

Source: U. S. Statistical Abstract, 1964 (Washington, D. C.: U. S. Department of Commerce, 1965), p. 114.

Thirdly, since students who were still in training at the time of the survey comprise a part of the sample for this study, the Minnesota State Employment Office was requested to provide information on the average expected annual earnings of the WATS students for the first three years after

their graduation. The amounts quoted were then used to estimate the respondent's earnings in the interviewing year (Aj), which was the first year after graduation.

Table 4. The Average Expected Annual Earnings of WATS Graduates During the First Three Years Years After Graduation

Program	Amounts
Auto Mechanics	$4,576
Auto Body Repair	4,378
General Office Clerk	3,300
Highway Technician	4,980
Industrial Electronics	4,784
Machine Tool and Die Making	4,680
Practical Nursing	3,000
Stenography	3,600
Welding	4,992

Source: Minnesota State Employment Office.

In addition, the Minnesota State Employment Office was asked to estimate the average earnings of high school graduates in the 19 - 24 years age bracket. 4/ Their estimate was $1.85 per hour. This information was needed to estimate the foregone earnings (P) of about 30 percent of the respondents who had reported no previous employment. What the respondent might have earned in the interviewing year (Bj) if he had not made any additional investment in his education (including on-the-job training) beyond the level attained when he entered the WATS was estimated to be $1.91. The assumption

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4/ High school graduates account for about 70 percent of our sample. However, adjustments were made for those respondents who reported less (or more) than 12 years of schooling.

is that his earnings in the interviewing year would be higher than a year or so before when he had entered the WATS. For females, the wage rates were estimated to be $1.40 and $1.44, respectively.

Social Rates. The WATS was asked to provide information on the direct social costs per student in each of the nine instructional programs and, in addition, to supply data on the average number of dropouts. The reported direct social costs per student were then increased by 15 percent, the average reported rate of withdrawal from the school.

Table 5. Direct Social Costs Per Student [a/]

Program	Amounts
Auto Mechanics	$772
Auto Body Repair	889
General Office Clerk	429
Highway Technician	879
Industrial Electronics	772
Machine Tool and Die Making	772
Practical Nursing	732
Stenography	619
Welding	933

a/ The amounts quoted are inclusive of 10 percent depreciation of capital and exclusive of the MDTA direct subsidies to students.

IV. THE RESULTS

The private and social rates of return for each of the nine instructional programs offered by the WATS were calculated on the basis of (1) the model explained in section II, and (2) the sources of information mentioned in

section III of this paper. 5/ The results are given in tables 6 - 14.

It is important to note that all the frequency distributions constructed below have open-end classes. This is why the median rather than the mean rates of return are quoted. Also, while some frequency distributions may appear almost U-shaped, they actually are not: observations falling between two extreme classes are usually widely scattered.

Table 6. Auto Mechanics Program

Sample: 8 graduates and 17 students
Population: 15 graduates and 17 students
Length of program: 74 weeks

Rate of Return	Age									
	TOTAL		19 - 24		25 - 34		35 - 44		45 - 54	
	Private	Social	Private	Social	Private	Social	Private	Social	Private	Social
TOTAL	25	25	24	24	1	1	-	-	-	-
0 or less	1	1	1	1	-	-	-	-	-	-
.01-9.99	3	4	3	3	-	1	-	-	-	-
10-19.99	7	8	7	8	-	-	-	-	-	-
20-29.99	4	3	3	3	1	-	-	-	-	-
30-39.99	2	4	2	4	-	-	-	-	-	-
40-49.99	1	-	1	-	-	-	-	-	-	-
50-59.99	1	-	1	-	-	-	-	-	-	-
60-75	1	1	1	1	-	-	-	-	-	-
over 75	5	4	5	4	-	-	-	-	-	-

Median private rate of return (Mr_o) = 20
Median social rate of return (MR_o) = 19

5/ For example: A graduate from the industrial electronics program reported the following data: age at graduation, 22 years old (i.e., his expected working life is 43 years); average weekly earnings before entering WATS, $82 (this figure multiplied by the length of the program--88 weeks--gives us P in equation 4); more than 12 years of schooling; total earnings while attending WATS, $2,200; present annual earnings, $5,400.

Incorporating these data into equation 4, we have:
$50 + 7{,}216\ (1-t_1) - 2{,}200\ (1-t_2) = (.895 \times 5{,}400 - .91 \times Bj) \times H.$

From table 1, we find that t_1 is 7.6 percent (if the respondent earned $7,216 for 88 weeks, his annual foregone earnings were $4,264) and t_2 is 6.4 percent. Using the procedures described on pages 11 - 12, we estimate Bj at $4,285 and solve for H. The rate of return corresponding to H = 5 and n = 43 is 20 percent.

Three out of five respondents whose calculated rates of return were over 75 percent reported relatively high current annual incomes ($7,800, $6,594, and $5,700). One respondent wrote that his annual income from full employment was $2,400, and consequently his calculated rate of return was negative.

Table 7. Auto Body Repair Program

Sample: 9 graduates and 20 students
Population: 16 graduates and 20 students
Length of Program: 50 weeks
MDTA-supported

Rate of Return	TOTAL		Age 19 - 24		25 - 34		35 - 44		45 - 54	
	Private	Social	Private	Social	Private	Social	Private	Social	Private	Social
TOTAL	29	29	26	26	2	2	1	1	-	-
0 or less	7	7	6	6	-	-	1	1	-	-
.01-9.99	7	12	6	10	1	2	-	-	-	-
10-19.99	3	6	3	6	-	-	-	-	-	-
20-29.99	3	3	3	3	-	-	-	-	-	-
30-39.99	2	-	2	-	-	-	-	-	-	-
40-49.99	-	-	-	-	-	-	-	-	-	-
50-59.99	-	-	-	-	-	-	-	-	-	-
60-75	1	-	1	-	-	-	-	-	-	-
over 75	6	1	5	1	1	-	-	-	-	-

Median private rate of return (Mr_o) = 11
Median social rate of return ($\overline{Mr}_o$) = 9

Five out of six respondents whose calculated rates of return were over 75 percent received direct subsidies from MDTA while attending the school. This meant that their indirect costs of investing in education (the P-E spread in equation 1) were either substantially reduced or completely

eliminated. The effect of MDTA subsidies on the calculated private rates of return is easily seen when they are compared with the corresponding social rates of return, which were 3, 10, 13, 15,and 27 percent.

Three out of seven respondents whose calculated rates of return were zero or negative reported relatively low current incomes from full employment ($3,016, $3,120, and $3,328). Two other respondents in this class had relatively high preschool earnings ($2.40 and $3.85 per hour).

Table 8. Machine Tool and Die Making Program

Sample: 19 graduates and 16 students
Population: 32 graduates and 16 students
Length of Program: 74 weeks

Rate of Return	Age									
	TOTAL		19 - 24		25 - 34		35 - 44		45 - 54	
	Private	Social	Private	Social	Private	Social	Private	Social	Private	Social
TOTAL	35	35	33	33	2	2	-	-	-	-
0 or less	7	7	5	5	2	2	-	-	-	-
.01-9.99	2	1	2	1	-	-	-	-	-	-
10-19.99	8	9	8	9	-	-	-	-	-	-
20-29.99	2	2	2	2	-	-	-	-	-	-
30-39.99	1	2	1	2	-	-	-	-	-	-
40-49.99	4	3	4	3	-	-	-	-	-	-
50-59.99	-	1	-	1	-	-	-	-	-	-
60-75	2	4	2	4	-	-	-	-	-	-
over 75	9	6	9	6	-	-	-	-	-	-

Median private rate of return (Mr_o) = 24
Median social rate of return ($\overline{Mr}_o$) = 24

Three out of seven respondents whose calculated rates of return were zero or negative reported relatively low current incomes from full employment ($1,962, $3,120, and $3,445).

Table 9. Highway Technician Program

Sample: 9 graduates and 19 students
Population: 20 graduates and 19 students
Length of Program: 26 weeks
MDTA-supported

Rate of Return	Age									
	TOTAL		19 - 24		25 - 34		35 - 44		45 - 54	
	Private	Social	Private	Social	Private	Social	Private	Social	Private	Social
TOTAL	28	28	22	22	5	5	1	1	-	-
0 or less	6	3	-	-	5	2	1	1	-	-
.01-9.99	2	6	2	3	-	3	-	-	-	-
10-19.99	1	6	1	6	-	-	-	-	-	-
20-29.99	4	4	4	4	-	-	-	-	-	-
30-39.99	5	7	5	7	-	-	-	-	-	-
40-49.99	2	1	2	1	-	-	-	-	-	-
50-59.99	2	-	2	-	-	-	-	-	-	-
60-75	2	1	2	1	-	-	-	-	-	-
over 75	4	-	4	-	-	-	-	-	-	-

Median private rate of return (Mr_o) = 36
Median social rate of return (MR_o) = 17

Three out of four respondents whose calculated rates of return exceeded 75 percent received direct subsidies from MDTA while attending the school. Their calculated social rates of return were 18, 28, and 39 percent. Three out of six respondents whose calculated rates of return were zero or negative reported relatively high preschool earnings ($3.10, $3.15, and $3.45 per hour).

Table 10. Welding Program

Sample: 24 graduates and 28 students
Population: 41 graduates and 28 students
Length of Program: 26 weeks
MDTA-supported

Rate of Return	TOTAL		Age 19 - 24		25 - 34		35 - 44		45 - 54	
	Private	Social	Private	Social	Private	Social	Private	Social	Private	Social
TOTAL	52	52	32	32	11	11	5	5	4	4
0 or less	10	10	3	3	3	3	1	1	3	3
.01-9.99	4	7	3	6	1	1	-	-	-	-
10-19.99	4	10	4	4	-	3	-	3	-	-
20-29.99	2	11	-	7	2	4	-	-	-	-
30-39.99	3	4	1	3	1	-	1	-	-	1
40-49.99	3	4	2	3	1	-	-	1	-	-
50-59.99	2	1	2	1	-	-	-	-	-	-
60-75	2	3	2	3	-	-	-	-	-	-
Over 75	22	2	15	2	3	-	3	-	1	-

Median private rate of return (Mr_o) = 53
Median social rate of return ($M\bar{r}_o$) = 19

Fifteen out of twenty-two respondents whose calculated rates of return were over 75 percent received direct subsidies under MDTA while attending the school. Their calculated social rates of return were:

Class	Frequency
10-19.99	4
20-29.99	6
30-39.99	1
40-49.99	3
50-59.99	0
60-75	1

Five out of ten respondents whose calculated rates of return were zero or negative reported relatively high preschool earnings ($2.50 - $3.10 per hour).

Table 11. Industrial Electronics Program

Sample: 16 graduates and 15 students
Population: 32 graduates and 15 students
Length of Program: 88 weeks

Rate of Return	Age									
	TOTAL		19 - 24		25 - 34		35 - 44		45 -54	
	Private	Social	Private	Social	Private	Social	Private	Social	Private	Social
TOTAL	31	31	29	29	2	2	-	-	-	-
0 or less	3	3	1	1	2	2	-	-	-	-
.01-9.99	-	-	-	-	-	-	-	-	-	-
10-19.99	10	9	10	9	-	-	-	-	-	-
20-29.99	7	8	7	8	-	-	-	-	-	-
30-39.99	2	2	2	2	-	-	-	-	-	-
40-49.99	2	2	2	2	-	-	-	-	-	-
50-59.99	1	1	1	1	-	-	-	-	-	-
60-75	-	1	-	1	-	-	-	-	-	-
over 75	6	5	6	5	-	-	-	-	-	-

Median private rate of return (Mr_o) = 22
Median social rate of return ($\overline{Mr}_o$) = 23

One out of three respondents whose calculated rates of return were zero or negative reported a surprisingly low annual income from full employment ($1,962).

Table 12. General Office Clerk Program

Sample: 9 graduates and 15 students
Population: 16 graduates and 15 students
Length of Program: 24 weeks
MDTA-supported

Rate of Return	TOTAL		Age 19 - 24		25 - 34		35 - 44		45 - 54	
	Private	Social	Private	Social	Private	Social	Private	Social	Private	Social
TOTAL	24	24	14	14	1	1	6	6	3	3
0 or less	3	3	2	2	-	-	1	1	-	-
.01-9.99	1	1	-	-	-	-	-	-	1	1
10-19.99	2	5	-	1	-	1	1	2	1	1
20-29.99	1	2	-	-	-	-	1	1	-	1
30-39.99	1	9	-	8	-	-	-	1	1	-
40-49.99	9	4	8	3	-	-	1	1	-	-
50-59.99	-	-	-	-	-	-	-	-	-	-
60-75	4	-	3	-	-	-	1	-	-	-
over 75	3	-	1	-	1	-	1	-	-	-

Median private rate of return (Mr_o) = 47
Median social rate of return ($\bar{Mr}_o$) = $35\frac{1}{2}$

All three respondents whose calculated rates of return exceeded 75 percent received direct subsidies through MDTA while attending the school. Their calculated social rates of return were 10, 15, and 16 percent.

Two out of three respondents whose calculated rates of return were zero or negative reported relatively low annual incomes from full employment ($2,400).

Table 13. Stenography Program

Sample: 36 graduates and 19 students
Population: 47 graduates and 19 students
Length of Program: 32 weeks
MDTA-supported

Rate of Return	Age									
	TOTAL		19 - 24		25 - 34		35 - 44		45 - 54	
	Private	Social	Private	Social	Private	Social	Private	Social	Private	Social
TOTAL	55	55	22	22	8	8	16	16	9	9
0 or less	8	8	2	2	2	2	4	4	-	-
.01-9.99	6	10	1	1	1	2	3	4	1	3
10-19.99	3	7	1	3	1	3	-	1	1	-
20-29.99	4	10	3	4	1	-	-	3	-	3
30-39.99	5	12	-	5	-	1	3	3	2	3
40-49.99	7	-	2	-	-	-	3	-	2	-
50-59.99	3	4	1	3	-	-	1	1	1	-
60-75	4	3	2	3	1	-	1	-	-	-
over 75	15	1	10	1	2	-	1	-	2	-

Median private rate of return (Mr_o) = 42
Median social rate of return ($\overline{Mr}_o$) = 22

Seven out of fifteen respondents whose calculated rates of return were over 75 percent received direct subsidies through MDTA while attending the school. The social rates of return were 3, 12, 17, 24, 25, 26, and 75 percent.

Table 14. Practical Nursing Program

Sample: 66 graduates and 20 students
Population: 104 graduates and 20 students
Length of Program: 50 weeks

Rate of Return	Age									
	TOTAL		19 - 24		25 - 34		35 - 44		45 - 54	
	Private	Social	Private	Social	Private	Social	Private	Social	Private	Social
TOTAL	86	86	76	76	7	7	3	3	-	-
0 or less	8	8	7	7	1	1	-	-	-	-
.01-9.99	9	9	6	6	3	3	-	-	-	-
10.19.99	25	32	23	28	1	3	1	1	-	-
20-29.99	16	13	14	12	2	-	-	1	-	-
30-39.99	7	13	6	13	-	-	1	-	-	-
40-49.99	6	4	6	3	-	-	-	1	-	-
50-59.99	4	3	3	3	-	-	1	-	-	-
60-75	8	3	8	3	-	-	-	-	-	-
over 75	3	1	3	1	-	-	-	-	-	-

Median private rate of return (Mr_o) = 20
Median social rate of return ($\overline{Mr}_o$) = 18

Table 15. Sampling Distribution of Sample Medians

Rates of Return	Frequencies	
	Private	Social
.01-9.99	-	1
10-19.99	1	4
20-29.99	4	3
30-39.99	1	1
40-49.99	2	-
50-59.99	1	-

V. CONCLUSIONS

If the calculated rates of return in section IV were either equal to or below the true private and social rates of return on investment in WATS, as the analysis suggests, the following conclusions about the school and its performance can be derived.

From the Individual's Point of View. The wide variation in private gains within each instructional program suggests that an individual must place considerable weight on his own ability and situation and hope for the best. The fact that the calculated rates of return of a number of respondents were zero or less does not come as a surprise. Even among the most profitable industries and during the most prosperous times, some individual investment decisions are bound to fail. Also, a number of zero-or-less rates of return are attributable to the relatively high pre-WATS earnings of some respondents. Their decision to enter the school was, in some cases, motivated by previous job losses due to techological displacement. 6/ This means, of course, that their respective true rates of return were greater than zero. Finally, the total number of zero-or-less rates of return would have been considerably reduced if the Aj-Bj spread in equation 2 were assumed to grow at some small but positive rate (g>o).

6/ For example, when Swift and Company closed down its plant in Winona in February 1965, a number of well-paid people who were laid off entered the WATS.

Some rates of return are in excess of 75 percent, mostly for one of the following reasons: (1) relatively high reported annual income (Aj in equation 2); (2) small private indirect costs, i.e., small P-E spread in equation 1; and (3) direct subsidies under MDTA, which tended either to reduce or (quite frequently) completely eliminate private but not social indirect costs.

It can be concluded that the WATS has successfully performed at least two functions for its students. First, it has enabled inadequately skilled men and women to improve their earning power. The calculated median private rates of return on investment in education offered by the WATS are above or (in one case, the auto body repair program) about equal to the average rates of return an individual could expect to receive from other forms of investment. 7/ Secondly, the WATS may provide these men and women with a greater sense of purpose and accomplishment. Unsolicited statements added to the questionnaires by several respondents testify to this intangible, non-quantifiable, but nevertheless important service rendered by the WATS.

From the Community's Point of View. The distribution of individual observations about the median social rate of return in each of the nine programs offered by the WATS shows a considerable degree of symmetry and a strong central tendency. Although the median social rates of return are lower than private gains--in such programs as welding and highway technician, they are considerably lower--they are sufficiently high relative to the average rates of return from other types of investment to indicate that (1) the WATS has used resources allocated to it efficiently and profitably, and (2) use of the same resources elsewhere could not, on the average, be expected to provide the community with a higher rate of return. 8/

Finally, WATS is making an important contribution to the community by supplying its employers with a variety of skilled labor. This is particularly significant since about 80 percent of the WATS graduates remain in the area. Provision by the community of a steady supply of skilled workers could be a major selling point in attracting new industries to Winona.

7/ See George Stigler, Capital and Rates of Return in Manufacturing Industries, Princeton: Princeton University Press, 1963; and Gary Becker, op.cit.

8/ Ibid.